



INVESTOR IN PEOPLE

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PA - NICHIA KAGAKU KOGYO KK
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TI - CERAMIC LED PACKAGE AND MANUFACTURE THEREOF
IN - IZUNO KUNIHIRO; FUJIE SEIJI; TAKEUCHI ISATO; KANBARA YASUO; NAGAI YOSHIFUMI
IC - H01L33/00 ; G09F9/33

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PA - (NICH-N) NICHIA KAGAKU KOGYO KK
TI - Ceramic LED package mfg method used in planar display such as sign board, advertising board - involves forming optical [redacted] layer on side walls of tapering cavity to [redacted] light in direction of opening of cavity
PR - JP19950190533 19950726
IC - G09F9/33 ; H01L33/00
AB - JP09045965 The mfg method involves forming a decreasing tapering cavity (7) on a ceramic substrate (1) for positioning LED (3). An electrical conductive layer (2) galvanised with noble metal is formed on the bottom of cavity.
- The optical [redacted] layer (8) is formed on side walls of the cavity to [redacted] light from LED (3) in the direction of opening of cavity. A wiring part (4) connects LED with conductive material layer.
- ADVANTAGE - Improves display grace of LED. Simplifies mfg method.
- (Dwg.2/6)

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IN - IZUNO KUNIHIRO; FUJIE SEIJI; TAKEUCHI ISATO; KANBARA YASUO; NAGAI YOSHIFUMI
TI - CERAMIC LED PACKAGE AND MANUFACTURE THEREOF
AB - PROBLEM TO BE SOLVED: To obtain a ceramic LED package for realizing a high luminance LED display by providing a light [redacted] layer on the side face of a cavity.
- SOLUTION: When a cavity 7 for mounting an LED chip 3 is formed in a [redacted] green sheet provided with a conductor wiring, the [redacted] green sheet is pressed to be widened in the opening direction of cavity. It is then degreased and fired and a conductive layer 2 on the side face of cavity is subjected to plating of a noble [redacted] thus forming a light [redacted] layer 8.
I - H01L33/00 ; G09F9/33

JP09-45965

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to a ceramic LED package, and relates to the ceramic LED package which offers the LED display of high brightness by providing a specific light reflex layer on a mold cavity side face especially.

[0002]

[Description of the Prior Art] LED is used for flat-surface mold displays, such as a signboard and an ad pillar. It divides roughly into a LED display and what arranged in on a flat surface LED which carried out mold by resin, and the thing which laid the LED chip on the substrate, connected the electrode, and carried out mold by resin from on the are known. Since the latter LED display can constitute 1 pixel small and the screen where resolution is high can be realized also in it, much is expected in the future.

[0003] Generally in the latter LED display, an LED chip is laid in the ceramic LED package which consisted of ceramic substrates. There are a laminated circuit board which carried out the laminating of the substrate with which the conductor layer was formed in the front face, and a substrate with which the conductor layer was printed by the single insulating substrate as ceramic substrate. The LED chip with which the conductor layer was formed in the front face is laid on these ceramic substrate, and forward [of an LED chip] and a negative electrode are electrically connected to the surface conductor layer, respectively.

[0004] The type section Fig. which expresses the structure in the condition of having mounted the LED chip in the conventional ceramic LED package to drawing 1 is shown. It is the conductor layer by which 1 was used as the ceramic substrate and pattern formation of 2 was carried out to the front face of a ceramic substrate. Metals, such as W and Ag, are printed, Au plating is performed and the conductor layer 2 is formed in order to raise an adhesive property with the LED chip 3 from on the. The LED chip 3 is pasted up with adhesives etc. on a conductor layer, and an electrode is connected with an electrode with wires, such as a gold streak. The conductor layer 2 is connected with the wiring terminal 4 through the beer hall or through hole of a SERAMMIKKUSU

substrate. The mold cavity 7 which should lay LED is surrounded by the lateral portion 5 of the same quality of the material as substrates, such as an alumina, and is made not to carry out color mixture to luminescence of multicolor LED to which this acts as Idemitsu of the luminescence from LED efficiently to the front and which it adjoins.

[0005]

[Problem(s) to be Solved by the Invention] However, to some extent, the ceramics represented by the alumina has translucency and is imperfect for using it for the purpose as light reflex material which was described above. When luminescence from LED carries out ON light to the light reflex layer of SERAMMIKKUSU, a part will become the transmitted light 6 and will act in the direction which is not wished as Idemitsu. This light poses a problem on which it is not used effective in the front, and color mixture is carried out to luminescence from other LED, and the display grace of a LED display is reduced.

[0006]

[The means for solving invention] As a result of examining wholeheartedly the structure which improves the reflective effectiveness of a light reflex layer to the problem mentioned above, this invention person used the metal for the light reflex layer, by moreover considering as the structure where the taper is attached in the direction of opening, finds out that an ideal LED package is obtained and came to complete this invention.

[0007] That is, the light-reflex layer which consists of the same quality of the material as said conductor layer is formed in the front face of the ceramic substrate of a lateral portion, and the ceramic LED package of this invention is characterized by to incline so that the lateral portion of said mold cavity may become large in the direction of opening in the LED package which consists of a lateral portion which surrounds the conductor layer which connection is carried out to an LED chip and supplies power to a ceramic substrate front face, the mold cavity which should lay an LED chip, and a mold cavity.

[0008] Although almost all things can be used for a light reflex layer if it is a metal, in this invention, a light reflex layer is a conductor layer at coincidence. Then, it is required to be covered with the metal which can carry out electric wiring of the front face with LED and a wire. for example, a conductor layer -- the conductor of a tungsten (W) metal

-- what is covered with Ag, noble metals like Au, or nickel in the wiring front face is used. A light reflex layer is formed by forming these conductors layer in a mold cavity side face continuously as it is fundamentally. That is, the ingredient of a light reflex layer serves as the structure of using the charge of facing of a conductor layer as it is.

[0009] When a wiring material is Ag, it is not necessary to cover noble metals on a front face, and can be used for a light reflex layer as it is, but although it can be used as it is as an electrical conducting material, since scattered reflection will increase and reflective effectiveness will fall if the front face is coarse as a light reflex layer, it is desirable to perform surface treatment or to cover noble metals further.

[0010] As an ingredient of a light reflex layer, a metal color shows good white and especially Ag excels [color] Au in the point of not giving change to the light color of the reflected light.

[0011] The SERAMMIKKUSU LED package of this invention can be preferably manufactured by the following approaches. namely, a conductor -- it faces forming the mold cavity which should lay an LED chip in the ceramic green sheet with which wiring was formed, and a mold cavity becomes large in the direction of opening about said ceramic green sheet -- as -- press forming -- carrying out -- a mold cavity lateral portion - - a conductor -- after forming printing and carrying out cleaning and baking, the noble metals which can connect to the conductor layer of a mold cavity side face the wire which carries out electric wiring to LED are covered, and a light reflex layer is formed.

[0012] the conductor formed in the lateral portion front face of the mold cavity formed by press forming -- printing does not need to be connected electrically. then, a conductor at the bottom -- although you may form independently with printing, it is more easier for an activity to consider as the structure which continued from the conductor layer.

[0013] Covering of the noble metals given to a conductor layer can apply an electroplating method, vacuum deposition, etc.

[0014]

[Function] Since the metaled light reflex layer is formed in the side face of a mold cavity, the ceramic LED package of this invention can have the good reflective effectiveness of light compared with ceramics which has translucency to some extent, such as the conventional alumina, can turn certainly to the front the light which acted to the

longitudinal direction as Idemitsu from LED, and it can improve the ratio which can be used as a LED display etc. among luminescence from an LED chip. Moreover, it can prevent carrying out color mixture to luminescence from LED of nearby other colors, and the display grace of a LED display can be improved.

[0015] If Ag is especially covered in a conductor layer, a metal color shows good white, and hardly gives change to the light color of the reflected light, but Ag's is the optimal as a ceramic LED package for LED displays.

[0016] Since the light reflex layer has structure which becomes large in the direction of opening as shown in drawing 2, it can be made to act in the direction of the front as Idemitsu of the luminescence to the longitudinal direction from LED certainly.

[0017]

[Example] The ceramic LED package of this invention is explained referring to a drawing.

[0018] The sectional view of the ceramic LED package of this example is shown in [example 1] drawing 2. The type section Fig. in the condition of having mounted the LED chip in the conventional ceramic LED package at conductor layer drawing 1 is shown in the front face of the ceramic substrate 1. 1 is a ceramic substrate and the conductor layer by which pattern formation of 2 of a bottom surface part was carried out to the front face of a ceramic substrate. The metal of a tungsten (W) is printed, and the conductor layer 2 is smoothly covered by the front face in Ag, and is having the adhesive property with the LED chip 3 raised. The LED chip 3 is pasted up with adhesives on a conductor layer, and an electrode is connected with an electrode by the gold streak. The conductor layer 2 is connected with the wiring part 4 through the through hole of a SERAMMIKKUSU substrate. On the other hand, the mold cavity 7 which should lay LED is surrounded by the lateral portion 5 of the same quality of the material as substrates, such as an alumina, and the light reflex layer 8 which covered Ag on the front face of the same W as a conductor layer is formed in the front face of a lateral portion 5, and the mold cavity 7 is large in the direction of opening.

[0019] The ceramic LED package of this example was produced as follows.

[0020] The green sheet which used the alumina as the principal component was cut down in predetermined size, and the through hole of 0.25mmphi was formed in it by the usual

approach using the punching machine. Next, stopgap of a through hole and printing of a wiring part were performed with tungsten conductive paste with screen printing from the side which does not lay LED.

[0021] Next, a conductor layer is printed for conductive paste with screen printing to the side which lays LED of a green sheet. In this case, magnitude of a conductor layer is made into a size including the part which forms a light reflex layer in the surroundings of those for the bottom surface part used as an original conductor layer.

[0022] a conductor -- the green sheet 10 with which printing 9 was formed is equipped with and pressed in a press machine, as shown in drawing 3 . the bottom surface part 13 and lateral portion 5 of a mold cavity after a press is completed, as shown in drawing 4 -- a conductor -- the green sheet which had printing formed is obtained. the conductor of the bottom surface part 13 of the mold cavity obtained behind -- printing -- the conductor of a conductor layer and a lateral portion 5 -- printing serves as a light reflex layer.

[0023] When an LED package needs to be behind broken and divided into each mold cavity, half cutting processing is performed so that rate picking may be made easy.

[0024] It degrades according to the usual approach, and the green sheet processed as mentioned above carries out combustion removal of the organic substance in a green sheet and conductive paste, forms a conductor layer, and ceramics-izes a green sheet at a baking process succeedingly.

[0025] the tungsten obtained by doing in this way by the last -- a conductor -- Ag was covered with the same electroplating method as giving the ceramic wiring substrate with which printing was formed to the usual conductor layer. \$ drawing 5 is the top view showing the condition of having mounted LED in the ceramic LED package of this example, and the broken line in a mold cavity shows the boundary of the light reflex layer of a side face, and a conductor layer at the bottom. When LED was made to turn on and having been evaluated, the improvement of the radiant power output of " %" was found compared with what used the conventional LED package whose description this example does not have in the light reflex layer shown in drawing 1 .

[0026] Although it is the purpose used for the display of [Example] 2 LED etc. and there is an LED package of the structure where blue, green, and the LED chip of red luminescence can be laid into a mold cavity, this invention is applicable also to a such

type ceramic LED package. The top view of the ceramic LED package which mounted blue (B) which is the three primary colors of light, green (G), and LED of red (R) luminescence in drawing 6 is shown. a conductor for this example to make LED of each B, and G and R turn on -- the green sheet with which printing was performed was produced by the same approach as an example 1.

[0027] This display mounted the red LED chip R which carries out the laminating of the ingredient of a GaAs system, and changes on the blue LED chip B and the green LED chip G with which for example, one mold cavity carries out the laminating of the ingredient of a GaN system, and changes on silicon on sapphire, and a GaAs substrate, and examined the ceramic LED package. While reflecting luminescence of an LED chip in a luminescence observation side side by the inside of a light reflex layer and raising the brightness of a LED display, as for luminescence of each LED, color mixture of the luminescent color is fully performed within a mold cavity.

[0028]

[Effect of the Invention] As explained above, since the metaled light reflex layer is formed in the side face of a mold cavity, the ceramic LED package of this invention can have the good reflective effectiveness of light compared with ceramics which has translucency to some extent, such as the conventional alumina, can turn certainly to the front the light which acted to the longitudinal direction as Idemitsu from LED, and can improve the ratio which can be used as a LED display etc. among luminescence from an LED chip. Moreover, it can prevent carrying out color mixture to luminescence from LED of nearby other colors, and the display grace of a LED display can be improved.

[0029] Moreover, if the approach of this invention is followed, while forming the conductor layer of the mold cavity bottom surface part which supplies power to LED, the light reflex layer of a mold cavity lateral portion can be formed in coincidence, and a ceramic LED package can be manufactured more easily.

[Claim(s)]

[Claim 1] It is the ceramic LED package characterized by for a lateral portion to incline so that it consists of a conductor layer to which said light-reflex layer performed light-reflex processing for the front face of a ceramic in the LED package possessing the mold

cavity which consists of a conductor layer which connection is carried out to an LED chip and supplies power to a ceramic substrate front face, and a light-reflex layer which surrounds the part which should lay an LED chip and said mold cavity may become large in the direction of opening.

[Claim 2] a conductor -- the manufacture approach of the ceramic LED package characterized by performing noble-metals plating to the conductor layer of a mold cavity side face, and forming a light reflex layer after facing forming the mold cavity which should lay an LED chip in the ceramic green sheet with which wiring was formed, carrying out press forming of said ceramic green sheet so that a mold cavity may become large in the direction of opening, and carrying out cleaning and baking.